INSTALLATION AND OPERATION MANUAL

D4E1, D8E1

4- and 8-Port E1 Interface Modules

Version 10.1

DXC Module

RAD
data communications
The Access Company

D4E1, D8E1

4- and 8-Port E1 Interface Modules

Version 10.1

Installation and Operation Manual

Notice

This manual contains information that is proprietary to RAD Data Communications Ltd. ("RAD"). No part of this publication may be reproduced in any form whatsoever without prior written approval by RAD Data Communications.

Right, title and interest, all information, copyrights, patents, know-how, trade secrets and other intellectual property or other proprietary rights relating to this manual and to the D4E1, D8E1 and any software components contained therein are proprietary products of RAD protected under international copyright law and shall be and remain solely with RAD.

D4E1, D8E1 is a registered trademark of RAD. No right, license, or interest to such trademark is granted hereunder, and you agree that no such right, license, or interest shall be asserted by you with respect to such trademark.

You shall not copy, reverse compile or reverse assemble all or any portion of the Manual or the D4E1, D8E1. You are prohibited from, and shall not, directly or indirectly, develop, market, distribute, license, or sell any product that supports substantially similar functionality as the D4E1, D8E1, based on or derived in any way from the D4E1, D8E1. Your undertaking in this paragraph shall survive the termination of this Agreement.

This Agreement is effective upon your opening of the D4E1, D8E1 package and shall continue until terminated. RAD may terminate this Agreement upon the breach by you of any term hereof. Upon such termination by RAD, you agree to return to RAD the D4E1, D8E1 and all copies and portions thereof.

For further information contact RAD at the address below or contact your local distributor.

International Headquarters
RAD Data Communications Ltd.

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel: 972-3-6458181
Fax: 972-3-6498250, 6474436
E-mail: market@rad.com

North America Headquarters
RAD Data Communications Inc.

900 Corporate Drive
Mahwah, NJ 07430, USA
Tel: (201) 5291100, Toll free: 1-800-4447234
Fax: (201) 5295777
E-mail: market@radusa.com

© 1993–2008 RAD Data Communications Ltd. Publication No. 772-236-11/08

Quick Start Guide

If you are familiar with the D4E1/D8E1 module, use this guide to prepare it for operation.

1. Connecting the Cables

- Insert the module in the assigned I/O slot.
- Connect the cables to the appropriate socket of the D4E1/D8E1 module.

2. Configuration Procedure

Configure each of the external ports using the command:

DEF PORT A:B<ENTER>

where **A** is the slot number and **B** is the number of each port to be configured (1 through 4 for D4E1, 1 through 8 for D8E1).

The configuration parameters and the allowed range of values are listed below.

First Page of External Port Parameters

Parameter	FRAME	CRC-4	SYNC	LINK_MODE	RX GAIN LIMIT
Range of Values	G732N G732S UNFRAMED	YES NO	CCITT 62411 FAST	TRANS REGULAR	SHORT HAUL LONG HAUL MONITOR+12 MONITOR+30
Parameter	**SA4**	**SA5**	**SA6**	**SA7**	**SA8**
Range of Values	MGMT TRANS ZERO ONE	MGMT TRANS ZERO ONE	MGMT TRANS ZERO ONE	MGMT TRANS ZERO ONE	MGMT TRANS ZERO ONE

Second Page of External Port Parameters

Parameter	CGA	IDLE_TS_CODE	OOS_SIGNALING	VOICE_OOS	DATA_OOS
Range of Values	**NONE** **TRANS** **FULL**	**00** to **FF**	**SPACE** **MARK** **SP_MK** **MK_SP**	**00** to **FF**	**00** to **FF**

Parameter	INB_MNG	ROUTE_PROT
Range of Values	**NONE** **TS0/F** **DEDIC** **D-PPP** **D-FR**	**NONE** **PROPRIET** **RIP-II**

Third Page of External Port Parameters (Static Timeslot Allocation Only)

Parameter	MAX_TS
Range of Values	**0** to **32**

Fourth Page of External Port Parameters

Parameter	MAP_MODE	START_TS	NUM_OF_TS	DEST_PORT	TYPE	DEST_START_TS
Range of Values	**SEQ** **USER**	**01** to **31**	**01** to **31**	Slot: **1** to **15** Port: **1** to **30**	**DATA** **VOICE** **VC-MP** **NC**	**01** to **31** for **E1** port **01** to **24** for **T1** port

Last Page of External Port Parameters

If the **MAP_MODE** is **USER**, you will see the port timeslot routing map. Select the timeslot connections (**NC** or destination) and timeslot types in accordance with your requirements.

The timeslot types are: **MGMT**
DATA
VOICE
VC-MP

Internal Port Parameters

To configure the internal port, enter the command:

DEF PORT A:i1<Enter>

The internal port parameters and their range of values are as follows:

Parameter	DEDICATE_TS_AGGR_SPEED
Range of Values	**NC** **64K**

Contents

Chapter 1. Introduction

1.1 Overview....1-1
Purpose and Main Features....1-1
Product Options....1-1
Applications....1-2
1.2 Physical Description....1-5
D4E1 Module....1-5
D8E1 Module....1-5
1.3 Functional Description....1-6
Functional Block Diagram....1-6
E1 Port Interface Characteristics....1-9
Port Routing Mode....1-10
Handling of National Bits....1-11
Handling of Alarm Conditions....1-11
Diagnostics....1-11
1.4 Technical Specifications....1-12

Chapter 2. Installation and Setup

2.1 Introduction....2-1
2.2 Installing the Module in the DXC Enclosure....2-1
2.3 Connecting the Module Ports....2-2
Module Connectors....2-2
Connecting Cables to the Module Ports....2-3

Chapter 3. Configuration

3.1 Outline of Configuration Procedure....3-1
3.2 Configuration Instructions....3-2
Starting a Configuration Session....3-2
Inclusion of D4E1/D8E1 Module in Database....3-2
Configuration of External Port Parameters....3-3
Configuration of Internal Port Parameters....3-11
Displaying D4E1/D8E1-Specific Information....3-12

Chapter 4. Troubleshooting and Diagnostics

4.1 Alarm Messages....4-1
4.2 Diagnostics....4-2
Test and Loopback Functions....4-2
4.3 Recommended Test Sequence....4-6
Troubleshooting New Connections....4-6
General Troubleshooting Procedure....4-7
4.4 Frequently Asked Questions....4-7
4.5 Technical Support....4-8

Appendix A. Pinouts

Chapter 1
Introduction

1.1 Overview

Purpose and Main Features

This manual describes the technical characteristics, applications, installation and operation of the D4E1/D8E1 family of E1 multi-port interface modules for the DXC-8R, DXC-10A and DXC-30 multiservice access nodes.

The D4E1/D8E1 family provides four or eight independent E1 ports that comply with the requirements of ITU-T Rec. G703, G.704, G.706 and G.732. Each port supports up to 31 timeslots, for a maximum payload capacity of up to 248 timeslots per module.

Each D4E1/D8E1 port can use G732N or G732S multiframes (2 or 16 frames per multiframe, respectively), in accordance with user's selection. D4E1 and D8E1 can also be operated in an unframed mode, to generate an ITU-T Rec. G.703 unframed signal. In addition, the user can also enable the CRC-4 option specified in ITU-T Rec. G.704, independently for each port.

In addition to other applications, the high port density of the D4E1/D8E1 modules permits to use the DXC for signal monitoring: the DXC collects signaling timeslots from many leased lines and grooms them over a full E1 link to the protocol analyzer at a central site.

Note

The D4E1/D8E1 modules are supported by the DXC version 10.0 or higher. (If support is required for earlier DXC versions, contact RAD technical Support.) In this manual, the generic term DCL is used when the information is applicable for both common logic versions. The complete designation is used only for information applicable to a specific version of common logic.

Product Options

The D4E1/D8E1 family includes two basic module types:

- D4E1 4-port E1 interface module.
- D8E1 8-port E1 interface module.

D4E1 and D8E1 modules support both balanced and unbalanced E1 interfaces through the use of special interface cables.

All the module versions occupy a single I/O slot in the DXC chassis.

Note

In this manual, the generic term D4E1/D8E1 is used when the information is applicable to all the module versions, and the term DXC is used when the information is applicable to all the multiservice access nodes versions. The complete designation is used only for information applicable to a specific version.

Applications

The D4E1/D8E1 modules provide all the functions available on the other types of DXC E1 interface modules, such as DE1B. The main advantage of D4E1/D8E1 modules is the large number of ports available on each module, which makes possible new applications.

High-Density Applications

Figure 1-1 shows a typical application that utilizes the large number of links that are supported by a DXC-30 chassis equipped with D8E1 modules: a DXC-30 chassis equipped with 14 D8E1 modules and one DE3 module can be used to groom up to 112 fractional E1 links into one E3 link, all this within a 3U-high enclosure which also includes redundant power supplies and redundant common logic modules.

This capability enables the DXC-30 system to serve as the feeder for an E3 network, or to access channelized E3 ports of higher-order switches in the plesiochronous (PDH) and synchronous (SDH) digital hierarchies.

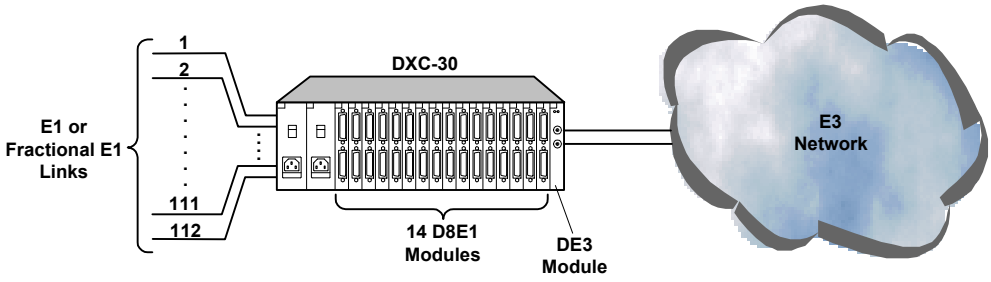

Figure 1-1. Typical High-Density Grooming Application for DXC-30

Figure 1-2 shows another application that illustrates the high density which can be achieved with D4E1/D8E1 modules: a 1U-high DXC-8R chassis can be used to provide T1/E1 conversion and cross-connect services for up to 32 links. For example, the DXC-8R can be equipped with three D8E1 and one D8T1 modules to provide conversion from up to 24 fractional E1 links into 8 T1 links, for transmission through a T1 transport network.

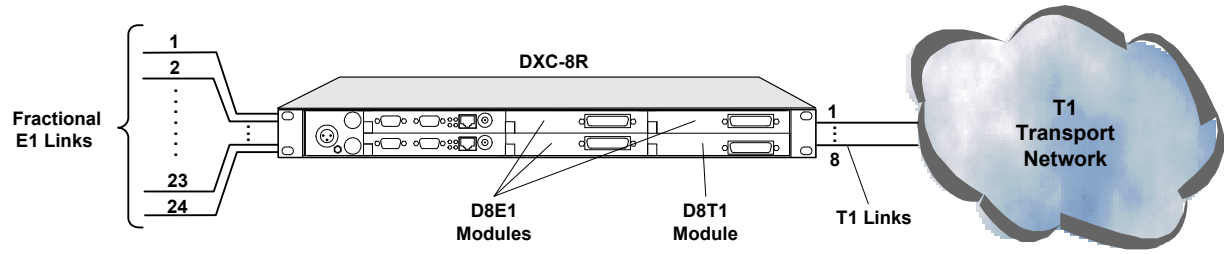

Figure 1-2. High-Density T1/E1 Conversion and Cross-Connect Application for DXC-8R

Figure 1-3 shows a 1U-high DXC-10A chassis used as an E3 multiplexer: for this purpose, the DXC-10A chassis is equipped with one DE3 and two D8E1 modules. The two additional slots of the DXC-10A chassis can then be used to provide other services.

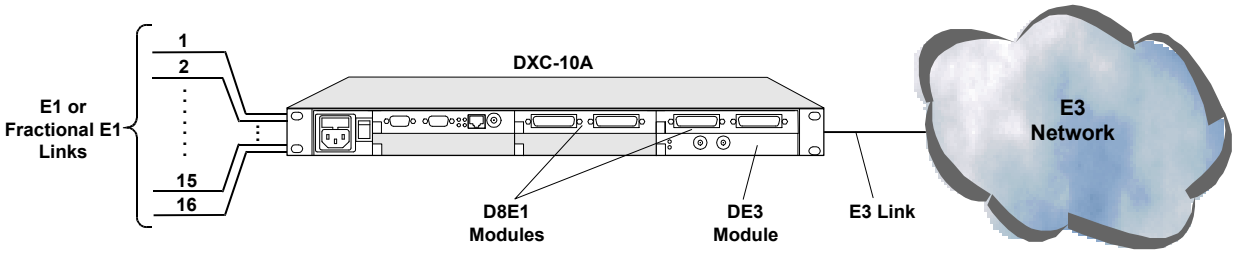

Figure 1-3. E3 Multiplexer Application for DXC-10A

Signaling Monitoring

The high port density of the D4E1/D8E1 modules allows another important DXC application: signaling monitoring. The DXC collects signaling timeslots from many leased lines and grooms them over a full link to the protocol analyzer at a central site. The analyzer reads the signals that identify each user, checks the user profile and activates the appropriate response.

The solution is based on a probe (passive T-sampler or patch panel) that duplicates the traffic on each voice channel and sends it to the DXC. The DXC extracts the signaling information from one or more timeslots of each voice channel and grooms all the timeslots onto one output E1 or E3 line. The timeslots are sent to the network management station at the central or regional office for analysis. Data from these timeslots indicate the quality of the connection and detect network faults. The same (or different) timeslots can be broadcast to billing, security, fraud detector or other systems without adding line probes. Additional destinations can be added at any time. The lines that connect the DXC to the probe are configured as unidirectional, so as not to interfere with the voice traffic passing on the line. Since the traffic is transparent to the DXC, it can support any signaling protocol, provided that the signaling information resides in the same timeslot of each E1 link.

Figure 1-4 and *Figure* 1-5 show a DXC-8R chassis equipped with the D8E1 module in a signaling monitoring application, using a patch panel and a passive T-sampler, respectively.

For details regarding the integration of the D4E1 and D8E1 modules in DXC systems and additional system applications, refer to the *DXC Installation and Operation Manual*.

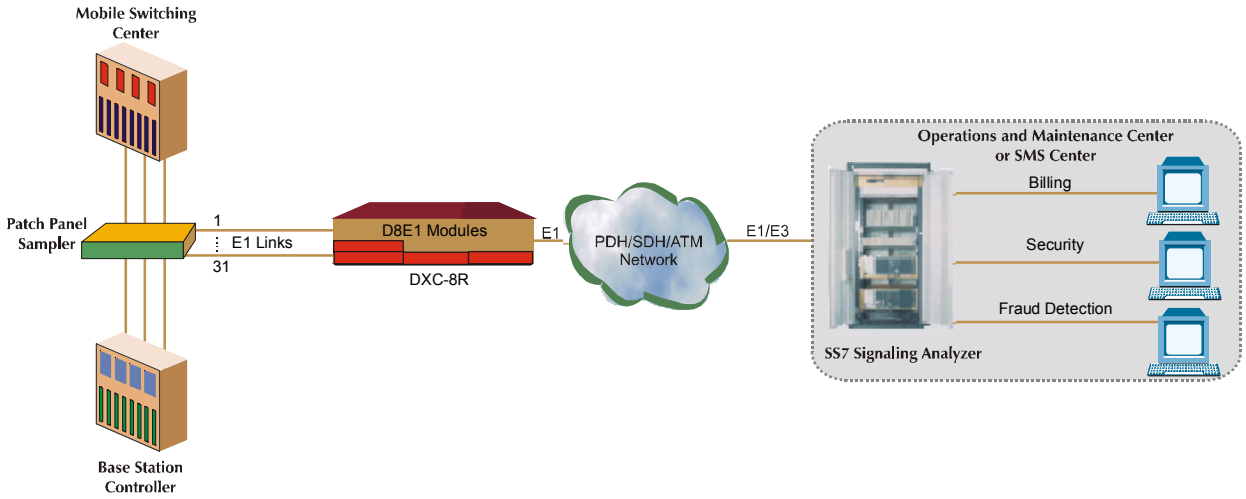

Figure 1-4. Signaling Monitoring with Patch Panel Sampler

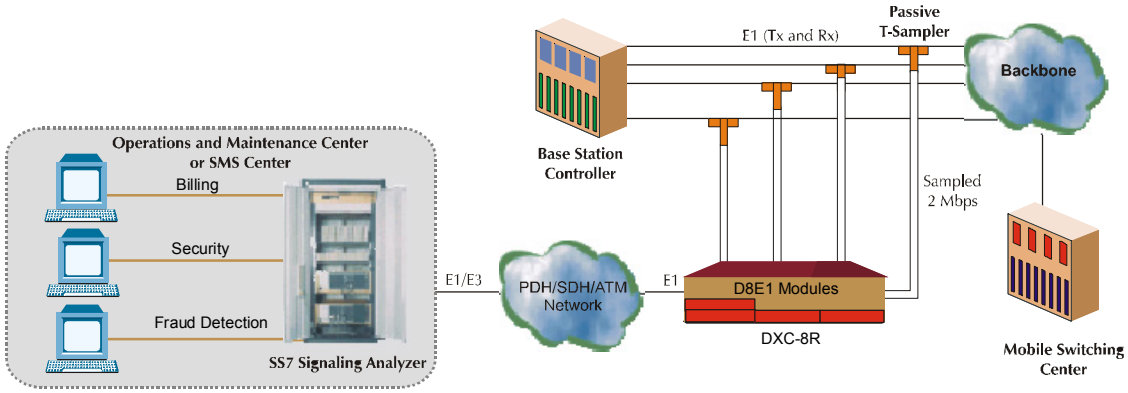

Figure 1-5. Signaling Monitoring with Passive T-Sampler

Note

Since high-density modules usually require more than two bus links, they have been designed as modules with dynamic timeslot allocation. When designing a DXC application with these modules, it is important to understand the Automatic Timeslot Allocation for various DXC modules described in Chapter 3 of the DXC Installation and Operation Manual and follow a number of important design and configuration guidelines recommended by RAD. For design guidelines refer to "Design Guidelines for a High-Density Module Application" (Chapter 3 of the DXC Installation and Operation Manual). For configuration guidelines, refer to "Checking for Free Timeslots" in Chapter 6.

1.2 Physical Description

D4E1 Module

Figure 1-6 shows the panel of the D4E1 module.

The panel includes four RJ-45 connectors, one for each port.

A cable is available for providing an E1 unbalanced interface with BNC connectors to the user equipment.

LEDs on the front panel indicate a local or remote sync loss alarm for each line.

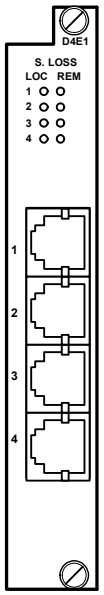

Figure 1-6. D4E1 Module Panel

D8E1 Module

Figure 1-7 shows the panel of the D8E1 module.

The panel includes one DB-44 female connector.

For the balanced version, a cable is available converting the DB-44 connectors to eight RJ-45 balanced connectors.

For the unbalanced version, a cable is available converting one DB-44 connector to 8 pairs of BNC unbalanced connectors.

LEDs on the front panel indicate a local or remote sync loss alarm for each line.

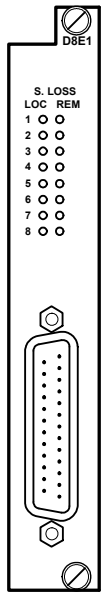

Figure 1-7. D8E1 Module Panel

1.3 Functional Description

Functional Block Diagram

Figure 1-8 shows the functional block diagram of the D8E1 module. The block diagram of the D4E1 module version is similar, except that it does not include the ports 5 through 8 and the associated circuits.

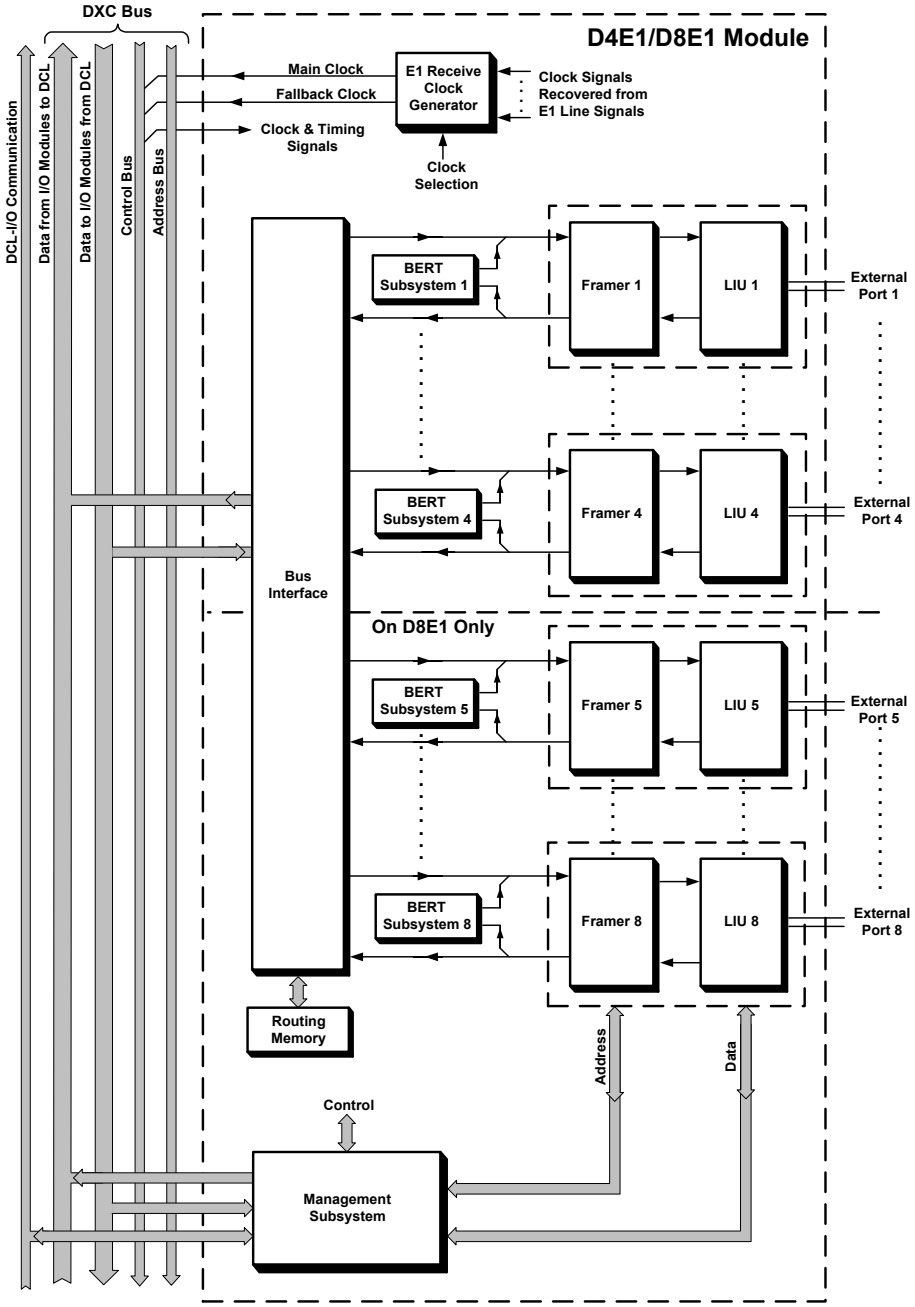

Figure 1-8. D4E1/D8E1 Functional Block Diagram

The D4E1 and D8E1 modules include the following main subsystems:

- Bus interface subsystem
- Line interface subsystem
- Clock and timing subsystem
- BERT subsystem
- Management subsystem.

Bus Interface Subsystem

The function of the bus interface subsystem is to route the desired timeslots between the DXC bus (the bus that carries the traffic of the other modules installed in the DXC unit) and the appropriate E1 ports of the D4E1/D8E1 module. In case of alarm conditions, the bus interface inserts appropriate user-specified out-of-service (OOS) codes, provided by the module management subsystem.

The DXC bus includes two data buses:

- ***Data from I/O bus*** - carries the data from I/O modules and D4E1/D8E1 to the DCL module.
- ***Data to I/O bus*** - carries data to I/O modules and D4E1/D8E1 from the DCL module.

The bus interface operates as a non-blocking routing matrix that can map timeslots from the DXC bus to any of the timeslots of the D4E1/D8E1 E1 ports. The routing matrix is controlled by the DXC common logic subsystem (located in the DCL module). The DXC common logic subsystem transmits the routing control data to a routing memory that stores the local D4E1/D8E1 routing database, and controls the operation of the matrix. This ensures that the operation of the D4E1/D8E1 routing matrix is coordinated with the operation of the main cross-connect matrix located on the DCL module, and thus utilize in the most efficient way the bandwidth of the DXC data bus (refer to *Chapter 3* of the *DXC Installation and Operation Manual* for a description of the DXC main routing matrix and DXC bus).

Because of the large number of bus links needed to support four or eight module ports, timeslot allocation for the module is in accordance with the Type 2 allocation as described in *Chapter 3* of the *DXC Installation and Operation Manual.* This means that the module supports both types of timeslot allocation available on the DXC:

- Dynamic allocation – bus bandwidth is automatically allocated in accordance with the actual number of timeslots routed to each port. This approach utilizes the bus bandwidth in the most efficient way, however it may cause short disruptions in traffic (perceived by the users as short bursts of errors) when bus timeslots are reassigned after inserting new modules or changing the bandwidth (number of timeslots) assigned to modules.
- Static allocation – bus bandwidth is permanently assigned to each port on the basis of the maximum number of timeslots that are expected to be routed to each port, in accordance with the planned traffic load. This allocation is less efficient than dynamic allocation, because the number of timeslots allocated to the port includes not only timeslots actually carrying

traffic, but also timeslots reserved for future growth. However, the advantage of this method is that when timeslots reserved for a port are allocated to traffic, there is no disruption to the traffic of other ports.

The timeslot allocation method used by the DXC (dynamic or static) is selected by the user.

In addition to the routing of payload data, the D4E1 and D8E1 modules support the allocation of one user-selectable timeslot to inband management.

Line Interface Subsystem

The line interface subsystem includes identical, independently operating E1 ports. The number of ports, 4 or 8, depends on the module version.

Each port consists of two sections:

- **Framer**. The transmit path of the framer generates the E1 frame structure transmitted by the corresponding port, in accordance with the selected framing mode. The frame structure is generated by combining the data transferred by the bus interface from the DXC bus with the CAS and framing overhead, and when applicable - with the inband management data stream (received through the microprocessor interface). Unused timeslots are filled with the user-specified idle code, provided by the module framers.

  The receive path of the framer demultiplexes the incoming E1 data stream, and extracts the payload data, CAS signaling information, and when applicable - the inband management data stream. The framer also collects performance statistics based on framing errors and errors detected by the CRC-4 monitoring function, which can be read by the DCL module through the module management subsystem.

- **LIU (line interface unit).** The LIU provides the interface to the external E1 line, and therefore its characteristics (nominal line impedance and signal levels) depend on the connection cable.

  The transmit path of the LIU includes an HDB3 coder, which converts the NRZ transmit data stream provided by the E1 framer to the line code specified for use on E1 links, and then generates the E1 transmit signal in accordance with ITU-T Rec. G.703.

  The receive path of the LIU recovers the received E1 signal and the associated clock signal. The recovered E1 signal is decoded by an HDB3 decoder, and sent to the receive path of the E1 framer in NRZ format. The receive path characteristics can emulate either as a DSU or LTU, as selected by the user in accordance with the required range.

  The HDB3 decoder can provide performance statistics for evaluating line transmission quality when the CRC-4 option is not used, by collecting data on the bipolar violations (BPVs) detected in the incoming signal.

Clock and Timing Subsystem

This subsystem provides the clock and timing signals required by the D4E1/D8E1 module, and enables the user to select the recovered clock signal of one of the module E1 ports as the timing reference for the DXC master (nodal) clock.

D4E1/D8E1 timing is derived as follows:

- The timing of the transmit paths of all the E1 ports is always locked to the DXC master clock, received through the control bus, part of the DXC bus.
- The timing of the receive paths of the E1 ports is always derived from the clock signal recovered from the incoming line signal.

The D4E1/D8E1 module includes a clock generator that generates two clock signals. Each of the two clock signals can be locked to the DXC master clock.

The two signals provided by the clock generator, which are connected to the control bus, can be selected as main and fallback timing references for the DXC master clock, thereby locking the DXC master clock to the timing of the corresponding E1 port.

BERT Subsystem

Each E1 port has its own BERT subsystem, which can be used to test the operation of each E1 port, and data transmission through the line connected to that port.

When the BER test is enabled on one of the D4E1/D8E1 ports, the bus interface disconnects that port from the DXC bus. During the test, the transmit signal is provided by the BER test sequence generator, in accordance with the BER testing parameters selected by the user. The received signal is applied to the test sequence evaluator, which detects the errors.

The error data is sent to the DCL module through the D4E1/D8E1 management subsystem.

Management Subsystem

The management subsystem controls the operation of the D4E1/D8E1 module, under the control of the DCL module. The management and supervision data is exchanged through the address and control buses, part of the DXC bus.

When inband management is enabled, the management subsystem transmits and receives management traffic through microprocessor interface. In this case, the management traffic exchanged through the port interfaces is transferred to the DCL module through an internal port, operating at a data rate of 64 kbps.

E1 Port Interface Characteristics

The E1 port interfaces of the D4E1/D8E1 module meet the applicable requirements of ITU-T Rec. G.703, G.704, G.706, G.732 and G.823.

Framing

The E1 port interfaces support both G732N and G732S multiframes (2 or 16 frames per multiframe, respectively), or unframed 2 Mbps data flow as per ITU-T Rec. G.703, in accordance with user's selection. The user can also select the frame synchronization algorithm: standard (in accordance with ITU-T Rec. G.704), in accordance with AT&T TR-62411, or a proprietary fast algorithm.

The port interfaces also supports the CRC-4 option, as specified in ITU-T Rec. G.704, thereby enabling the monitoring of the links to the DXC.

The framing mode and CRC-4 use are user-programmable, separately for each port.

Physical Interface

D4E1/D8E1 modules use the HDB-3 line code. Jitter performance complies with the requirements of ITU-T Rec. G.823.

The D4E1/D8E1 E1 port interfaces have integral LTUs for long-haul operation, covering line attenuations up to 36 dB. For short-haul operation, the user can configure the port interface to emulate a DSU (in this case, the maximum line attenuation is 10 dB).

For monitoring applications, the receiver provides gain of 12 dB or 30 dB (software-selectable) to overcome the resistive loss of the monitor connection, along with 0 to 6 dB of cable attenuation.

Port Routing Mode

To expedite the handling of the E1 data streams (in particular those multiplexed into E3 or T3 data streams), the user can specify the routing mode of each module ports:

- Regular Routing - in this mode, the routing subsystem can independently route the individual timeslots of the port. This mode supports the timeslot cross-connect function, and therefore the timeslots of an E1 port using regular routing can also be routed to other types of I/O modules, such as DE1B, DT1B, DIM, DE3, DT3 or DHS modules.

  This mode enables the transmission of a full E1 data stream from a module port through another E1 port located on any module with E1 ports, including internal E1 ports of an E3 module; it also enables the transmission of a full T1 data stream received from another I/O module with T1 ports (including the F-bit) through an E1 link, in accordance with ITU-T Rec. G.802.

- Transparent Routing - in this mode, the routing subsystem transparently transfers the whole frame structure (including timeslot 0 and timeslot 16), toward another E1 port, including an internal E1 port of a DE3 module. The other port must also use the transparent mode.

The regular routing mode is suitable for data traffic, for which it is not necessary to support end-to-end transmission of channel-associated signaling. In addition, when transmitting inband management traffic through the E1 link in a dedicated timeslot, the E1 port that carries the management timeslot must always be configured for regular routing.

The transparent mode enables the transmission of an E1 data stream carrying voice traffic, because it preserves the original E1 multiframe structure.

Handling of National Bits

The D4E1/D8E1 modules enable the user to control the handling of the national bits, S_{a4} through S_{a8}, in timeslot 0.

For each port, the user can select the utilization and state of each bit, in accordance with the following options:

- Transfer of management traffic: when the inband management traffic is carried in timeslot 0, the user can select the S_a bits that will carry the traffic.
- Transparent transfer of the desired bits.
- Setting of any bit to the desired fixed value, "0" or "1".

Handling of Alarm Conditions

The E1 ports support two types of indications in the individual timeslots: idle timeslots and out-of-service (OOS) indications.

- **Idle Timeslot Indication**. A special code can be transmitted in empty timeslots (timeslots which do not carry payload).
- **OOS Indications**. The OOS code is inserted in individual timeslots to signal the equipment routed to one of the E1 ports of the module that the link connected to the external port is out-of-service (e.g., because of the reception of AIS, loss of signal, loss of frame synchronization). All the ports use the same OOS code.

For a complete description of alarm handling in the DXC system, refer to *Section 3.5* in the *DXC Installation and Operation Manual*.

Diagnostics

To reduce downtime to a minimum, the D4E1/D8E1 module includes self-test upon power-up, and additional testing and diagnostic functions that can be controlled by means of the management functions supported by the DXC system (supervision terminal, SNMP or Telnet).

Test and Loopback Functions

The testing capabilities include the following types of loopbacks:

- **Local loopback**: the output signal of the E1 port is looped back to the input, and is returned toward the local DXC.
- **Remote loopback**: the signal received by the E1 port is regenerated and looped back to the transmit path of the port, and then returned toward the remote equipment. The remote loopback can also be activated on individual timeslots by transmitting the FT1 inband loopback activation code (remote timeslot loopback).
- **BER testing:** to enable testing of marginal links, the D4E1/D8E1 module supports bit error rate (BER) testing on each port, using a locally generated pseudorandom sequence.

To provide compatibility with other BER testing equipment, the user can select the pseudorandom pattern.

Performance Diagnostics

The D4E1/D8E1 supports the collection of performance diagnostics, using the CRC-4 function. The collected performance data is similar to the requirements of AT&T Pub. 54016.

If the CRC-4 function is disabled, a D4E1/D8E1 port can still provide diagnostic information on bipolar violations detected at the port.

1.4 Technical Specifications

General	*Function*	E1 multi-port I/O module
	Number of Ports	
	D4E1	4 E1 ports
	D8E1	8 E1 ports
	Data Rate	2.048 Mbps ±50 ppm
E1 Port Characteristics	*Framing Options*	G.732N, G.732S with or without CRC-4 protection in accordance with ITU-T Rec. G.704 Unframed as per G.703
	Applicable Standards	ITU-T Rec. G.703, G.704, G.706, G.732, G.823
	Interface Options	Software-selectable
	Short Haul (DSU)	-10 dB maximum line attenuation
	Long Haul (LTU)	-36 dB maximum line attenuation
	Monitoring Mode	Software-selectable: • 20 dB gain to compensate resistive attenuation • 32 dB gain to compensate resistive attenuation
	Line Code	HDB3
	Unbalanced E1 Port (UNBAL Option)	
	Line Impedance	75Ω
	Pulse Shape	ITU-T Rec. G.703

	D4E1 Connectors	Four pairs of 1.0/2.3 mm female connectors (one pair for each port)
	D8E1 Connectors	Eight pairs of 1.0/2.3 mm female connectors, or two 25-pin D-type female connectors for all module ports
	Balanced E1 Port (BAL Option)	
	Line Impedance	120Ω
	Pulse Shape	ITU-T Rec. G.703
	D4E1 Connectors	Four RJ-45 connectors (one for each port)
	D8E1 Connectors	Eight RJ-45 connectors, one for each port, or two 25-pin D-type female connectors for all module ports
Timing	*Port Timing*	• Receive timing recovered from incoming line signal • Transmit timing locked to the DXC master clock • DXC master clock can be locked to one of the recovered internal E1 port clock signals
Diagnostics	*Loopbacks*	• User-activated local and remote loopback on each E1 port • Remote loopback activation by inband FT1 code
	Performance Monitoring	RFC 2495 (substitutes RFC 1406)
Indicators	*S LOSS LOC (red)*	Local signal loss for each module port
	S LOSS REM (red)	Remote signal loss for each module port
Physical		Occupies a single DXC module slot
Power Consumption	*D4E1*	5.5W (1.1A)
	D8E1	7.25W (1.45A)
Timeslot Allocation		• Sequential • User-defined, any timeslot to any timeslot mapping
Configuration		Programmable via DXC management

Chapter 2
Installation and Setup

2.1 Introduction

This chapter provides installation and operation instructions for the D4E1 and D8E1 modules.

The information presented in this chapter supplements the general installation and operation instructions contained in the *DXC Installation and Operation Manual*.

Warning

Before performing any internal settings, adjustment, maintenance, or repairs, first disconnect all the cables from the module, and then remove the module from the DXC enclosure.
No internal settings, adjustment, maintenance, and repairs should be performed by either the operator or the user; such activities should be performed only by a skilled technician who is aware of the hazards involved.
Always observe standard safety precautions during installation, operation, and maintenance of this product.

Caution

The D4E1 and D8E1 modules contain components sensitive to electrostatic discharge (ESD). To prevent ESD damage, always hold a module by its sides, and do not touch the module components or connectors.

2.2 Installing the Module in the DXC Enclosure

The D4E1/D8E1 modules do not have any user settings, and therefore no preparations are required before installation.

Revise the system installation plan and *Section 6.3, "Checking for Free I/O Slots"*, of the DXC Installation and Operation Manual and insert the module in the assigned I/O slot of the DXC enclosure. The module starts operating as soon as it is plugged into an operating enclosure.

2.3 Connecting the Module Ports

Module Connectors

Module Versions with RJ-45 Connectors

For these module versions, each port interface is terminated in an eight-pin RJ-45 connector, wired in accordance with *Table* 2-1.

Table 2-1. RJ-45 Port Connector, Pin Assignment

Pin	Pin Function
1	Receive Input (ring)
2	Receive Input (tip)
3	Frame Ground
4	Transmit Output (ring)
5	Transmit Output (tip)
6	Frame Ground
7, 8	Not Connected

Note

Pins not listed in the table are not connected.

Module Versions with DB-44 Connectors

For these module versions, each port interface is terminated in a 44-pin DB-44 connector, wired in accordance with *Table* 2-2.

Table 2-2. DB-44 Port Connector, Pin Assignment

Pin	Function	Pin	Function	Pin	Function	Pin	Function
1	CH-1 TX Tip	22	CH-5 TX Ring	9	CH-6 TX Tip	35	CH-4 RX Ring
2	CH-2 TX Ring	23	CH-5 RX Tip	10	CH-7 TX Tip	36	CH-4 RX Tip
3	CH-2 TX Tip	25	CH-7 TX Ring	11	CH-8 TX Ring	37	CH-5 RX Ring
4	CH-3 TX Tip	26	CH-7 RX Tip	12	CH-8 TX Tip	38	CH-6 RX Ring
5	CH-4 TX Ring	31	CH-1 RX Ring	16	CH-1 TX Ring	39	CH-6 RX Tip
6	CH-4 TX Tip	32	CH-2 RX Tip	17	CH-1 RX Tip	40	CH-7 RX Ring
7	CH-5 TX Tip	33	CH-2 RX Ring	19	CH-3 TX Ring	41	CH-8 RX Ring
8	CH-6 TX Ring	34	CH-3 RX Ring	20	CH-3 RX Tip	42	CH-8 RX Tip

Connecting Cables to the Module Ports

When the D4E1, D8E1 module operates, the module connector supports both balanced and unbalanced interfaces. For D4E1 every port is independent and can be balanced or unbalanced depending on the type of cable connected.

For D8E1, only one type of interface can be active (the interface is selected by the user): balanced or unbalanced. Each type requires a different adapter cable:

- **CBL-G703-8/RJ45**: this cable is used for balanced E1 interfaces
- **CBL-G703-8/COAX**: this cable is used for unbalanced E1 interfaces.

The port can automatically detect the type of adapter cable connected to the port cable: if the cable does not match the configured interface, an alarm is generated.

Table 2-3 shows the different types of cables required for making the connections to D4E1, D8E1 modules.

Table 2-3. D4E1, D8E1 Cables

Interface Type	D4E1	D8E1
Balanced	RJ-45 to RJ-45 (4 cables)	DB-44 to 8 × RJ-45 (one cable assembly) RAD part number: CBL-G703-8/RJ-45
Unbalanced	RJ-45 to BNC (4 cables)	DB-44 to 8 × BNC (one cable assembly) RAD part number: CBL-G703-8/COAX

Using the site installation plan, identify the cable intended for connection to the D4E1, D8E1 connector, and connect the cable to the module connector as explained below.

➤ **To connect the cable to the balanced E1 interface:**

1. For D4E1, connect the RJ-45 connector to the D4E1 front panel port.
2. For D8E1, connect the 44-pin connector of cable CBL-G703-8/RJ45 to the D8E1 front panel connector.
3. Connect the RJ-45 plug of each port interface (D8E1 plugs are marked CH-1 to CH-8) to the prescribed user's equipment or patch panel connector. Insulate unused connectors, to prevent accidental short-circuiting of their exposed contacts to metallic surfaces.

➤ **To connect the cable to the unbalanced E1 interfaces:**

1. For D4E1, connect the RJ-45 connector to the D4E1 front panel port.
2. Connect the 44-pin male connector of the cable CBL-G703-8/COAX to the D8E1 front panel connector.
3. Connect the BNC plugs of each port interface (the plugs are marked with the number of the port) to the prescribed user's equipment or patch panel connectors. Pay attention to correct connection:
   - TX connector serves as the transmit output of the port
   - RX connector serves as the receive input of the port.

Chapter 3

Configuration

This chapter provides configuration information for the D4E1 and D8E1 modules. The configuration activities are performed by means of the management system used to control the DXC unit.

The instructions appearing in this chapter assume that you are familiar with the management system being used: a supervision terminal or Telnet (covered by the *DXC Installation and Operation Manual*), or a network management system, e.g., the RADview network management system (refer to the *RADview User's Manual* for instructions).

3.1 Outline of Configuration Procedure

The configuration procedure for a new D4E1/D8E1 module includes the following main steps:

- Inclusion of a D4E1/D8E1 module not yet installed in the DXC into the DXC database. It permits to preprogram the module parameters, so when the module is installed in the enclosure it will immediately start operating in the desired mode. This function is performed by means of the **`DEF SYS`** command.
- Configuration of the external port parameters of the D4E1/D8E1 module, using the **`DEF PORT A:B`** command, where **`A`** is the D4E1/D8E1 slot number, and **`B`** is the port number.
- Configuration of the internal port parameters of the D4E1/D8E1 module, using the **`DEF PORT A:i1`** command, where **`A`** is the D4E1/D8E1 slot number.

In addition to the configuration functions listed above, you can display specific status information on the module external ports, using the **`DSP ST`** and **`DSP CON`** commands. Starting from version 7.1 (DCL.3 common logic), you can use the **`DSP TS UTILIZATION`** and **`DSP TS ALLOC`** commands to display the timeslot utilization percentage and the number of timeslots free for use on the port, module and system levels for all the ports of the Type 2 modules installed in the system.

3.2 Configuration Instructions

Starting a Configuration Session

If the supervision terminal is not yet connected to the DXC, connect the terminal and start a configuration session in accordance with the instructions appearing in *Chapter 5* of the *DXC Installation and Operation Manual*.

Inclusion of D4E1/D8E1 Module in Database

The DXC system automatically identifies the installed modules, therefore skip this step if the D4E1/D8E1 module to be configured is already installed in the equipment chassis.

1. If the D4E1/D8E1 module to be configured is not yet installed in the DXC, type:

   DEF SYS<Enter>

2. The system parameters data form is displayed. A typical data form for a DXC-30 is shown below (other DXC versions differ only in the number of slots to be configured). The form presents the current parameter values as defaults.

CLK_MASTER	CLK_FBACK	REDUNDANCY	STATION_CLOCK	MATRIX_MODE	DATE_FORMAT
INT	NONE	NO	2.048MHz	BIDIRECT	DD/MM/YYYY

3. Assuming that the only necessary change is the inclusion of a new D4E1 or D8E1 module in the system database, press **<Enter>**. For the DXC with DCL.3 common logic, versions 7.1 and higher, the second line of the system parameters data form is displayed. The second line controls the DXC timeslot allocation method (static, static 1:1 or dynamic – see description in *Appendix F* of the *DXC Installation and Operation Manual, DEF SYS command*) and the station clock interface type. A typical form is shown below.

TS_ALLOC_MODE	STATION_CLOCK_IF
STATIC	G703

4. After the desired parameter values are selected, press **<Enter>**. The next line of the system parameters data form is displayed. A typical data form for a DXC-30 is shown below:

IO :	NO 1	NO 2	NO 3	NO 4	NO 5
TYPE:	D4E1	D8E1	DT1_DSU	D4E1	DE1_LTU

5. Change the module type for each desired slot.

   To change the module installed in a specific slot, bring the cursor to the beginning of the field (slot) to be changed by pressing the spacebar, and then press **<F>** or **<B>** to scroll among the available selections. When the desired selection is displayed, press the spacebar to move to the next field.

6. After the desired module types are defined, press **<Enter>**. The fourth line of the DXC-30 system parameters data form, which covers the I/O slots 6 through 10, is displayed.

Repeat the procedure described above to change the modules types as required, and then press ‹Enter› to display the fifth, and last, line, which covers the I/O slots 11 through 15. A typical last line of the system parameters data form is shown below:

```
IO   :      NO 11       NO 12       NO 13       NO 14       NO 15
TYPE:       DIM         DHS         DE1_DSU     DT1_CSU     DHS
```

7. Change the module type for each slot as described above, and then press ‹Enter› to end.

Configuration of External Port Parameters

To configure the parameters of an external D4E1/D8E1 port, type:

```
DEF PORT A:B<Enter>
```

where:

- **A** is the D4E1/D8E1 slot number (1 through 15 for the DXC-30, 1 through 5 for the DXC-10A, and 1 through 4 for the DXC-8R)
- **B** is the external port number (1 through 4 for D4E1, and 1 through 8 for D8E1).

First Page of Internal Port Parameters

You will see the first page of the external port parameters data form. A typical page is shown below:

```
FRAME   CRC-4  SYNC   LINK_MODE  RX_GAIN_LIMIT  SA4    SA5    SA6    SA7    SA8
G732N   NO     CCITT  REGULAR    SHORT_HAUL     TRANS  TRANS  TRANS  TRANS  TRANS
```

The parameters included on the first page are explained in *Table 3-1*.

Table 3-1. First Page of External Port Parameters

Parameter	Function	Values (Default shown in bold)	
FRAME	Determines the framing method used by the selected external port	**G732N**	256N frame per ITU-T Rec. G.704 (2 frames per multiframe).
		G732S	256S frame per ITU-T Rec. G.704 (16 frames per multiframe).
		UNFRAMED	Unframed 2 Mbps data flow as per ITU-T Rec. G.703
CRC-4	Enables the generation of check bits (in accordance with the CRC-4 polynomial specified by ITU-T Rec. G.704) for the frames transmitted on the selected external port, and the checking of the check bits carried by the received frames	**NO**	CRC-4 option disabled.
		YES	CRC-4 option enabled.

Parameter	Function	Values (Default shown in bold)	
SYNC	Changes the synchronization algorithm used by the selected external port, to reduce the time required for the port to return to normal operation after local loss of synchronization.	**CCITT**	Complies with ITU-T Rec. G.732
		62411	In accordance with AT&T TR-62411 (after 10 seconds).
		FAST	After 1 second.
LINK_ MODE	This parameter controls the handling of traffic routed to the selected external port within the D4E1 or D8E1 module	**REGULAR**	Enables independent routing of each timeslot. This selection enables the timeslot cross-connect function on the D4E1/D8E1 module, and therefore the timeslots of an E1 port using regular routing can also be routed to other types of I/O modules, e.g., E1, T1, DIM, DE3, DT3 or DHS modules. Use this selection for routing data timeslots.
		TRANS	Enables transparent transfer of the whole E1 frame structure (including timeslots 0 and 16 for E1 frames), toward the external port (supported by DXC systems with software release 5 and higher). Use this selection to enable the transmission of the full E1 data stream received from an internal E1 interface of a DE3 I/O module through this port. This is required to carry voice traffic.
RX GAIN LIMIT	Determines the maximum attenuation of the receive signal that can be compensated for by the port receive path, to obtain the BER performance required by the standards	**SHORT HAUL**	Maximum attenuation of 10 dB, relative to the nominal transmit level.
		LONG HAUL	Maximum attenuation of 36 dB, relative to the nominal transmit level. The lower attenuation may actually improve the performance when operating over relatively short line sections, especially when operating over multi-pair cables. In such cables, significant interference is generated by the signals carried by other pairs, and therefore a weak desired signal may be masked by the interference.
		MONITOR+12	The receiver provides gain of 12 dB to overcome the resistive loss of the monitor connection, along with 0 to 6 dB of cable attenuation
		MONITOR+30	The receiver provides gain of 30 dB to overcome the resistive loss of the monitor connection, along with 0 to 6 dB of cable attenuation

Parameter	Function	Values (Default shown in bold)	
SA4	Controls the handling of the national bit S_{a4} by the corresponding port. This field is displayed only when the LINK_MODE is REGULAR	MGMT	The S_{a4} bit is used to carry inband management traffic (this option is required when the INB_MNG parameter is TS0/F).
		TRANS	The S_{a4} bit is transferred transparently to the S_{a4} bit of an adjacent port of the D4E1/D8E1 module (e.g., ports 1-2, 3-4, 5-6 or 7-8).
		ZERO	The S_{a4} bit is set to "0" before it is transferred to the S_{a4} bit of the external E1 interface.
		ONE	Same as above, except the S_{a4} bit is set to "1".
SA5	Controls the handling of the national bit S_{a5} by the corresponding port	Same options as for SA4	
SA6	Controls the handling of the national bit S_{a6} by the corresponding port	Same options as for SA4	
SA7	Controls the handling of the national bit S_{a7} by the corresponding port	Same options as for SA4	
SA8	Controls the handling of the national bit S_{a8} by the corresponding port	Same options as for SA4	

To change the displayed parameters, bring the cursor to the beginning of the field to be changed by pressing the spacebar, and then press F or B to scroll among the available selections. When the desired selection is displayed, press the spacebar to move to the next field.

When done, press **<Enter>** to display the next page.

Second Page of External Port Parameters

You will see the second page of the external port parameters data form. A typical page is shown below:

```
CGA     IDLE_TS_CODE    OOS_SIG      VOICE_OOS   DATA_OOS   INB_MNG      ROUTE_PROT
TRANS   7E              SPACE        00          00         NONE         NONE
```

The parameters included on the second page are explained in *Table 3-2*.

Table 3-2. Second Page of External Port Parameters

Parameter	Function	Values (Default shown in bold)	
CGA	Selects the method used to signal the carrier group alarm (CGA) state (link out-of-service) to the other end of the selected link	**NONE**	When a link is in the out-of-service state, the timeslots carry the appropriate OOS code (data or voice OOS code, in accordance with the type selected for each timeslot). In addition, for links with G.732S framing the signaling bits A, B also assume the OOS state, and signaling bits C and D assume the state 0 and 1, respectively.

Parameter	Function	Values (Default shown in bold)	
		TRANS	Same as for NONE, but the signaling bits are not forced to the OOS state. Used for voice applications with common channel signaling (proprietary signaling) and for channelized data applications.
		FULL	The state of the timeslots and state of the signaling bits is not changed. This mode is the fully-transparent mode, and is often used when the link carries channelized or unchannelized data.
IDLE_TS_ CODE	Selects the code transmitted to fill idle (unused) timeslots in the frames transmitted through the selected external port	The available selections are 00 to FF (hexa). Default: **3F**	
OOS SIGNALING	When NONE is selected for the CGA parameter, this parameter determines the state of the signaling bits during out-of-service periods	**SPACE**	The A and B signaling bits are forced to "1" during out-of-service periods.
		MARK	The A and B signaling bits are forced to "0" during out-of-service periods.
		SP_MK	The A and B signaling bits are forced to "1" for 2.5 sec, then switch to the "0" state until the out-of-service condition disappears.
		MK_SP	The A and B signaling bits are forced to "0" for 2.5 sec, then switch to the "1" state until the out-of-service condition disappears.
VOICE OOS	When NONE or TRANS has been selected for CGA, selects the code transmitted during out-of-service periods on the timeslots defined as voice timeslots	The available selections are 00 to FF (hexa). Default: **00**	
DATA OOS	When NONE or TRANS has been selected for CGA, selects the code transmitted during out-of-service periods on the timeslots defined as data timeslots	The available selections are 00 to FF (hexa). Default: **3E**	

Parameter	Function	Values (Default shown in bold)	
INB_MNG	Controls the transfer of inband management traffic through the selected external port. The D-PPP and D-FR traffic routing options are generally used with the RIP2 routing protocol. For a description of the various traffic routing options, refer to *Inband Management Traffic Routing* in *Section C.4* of the *DXC Installation and Operation Manual*	**NONE**	Transfer of management traffic is disabled. Always select this option when the selected port is configured for the TRANS (transparent) link mode, because this mode requires one-to-one mapping of timeslots to the source port.
		TS0/F	Transfer of management traffic is enabled. The management traffic is transferred using the national bits, S_{a4} through S_{a8}.
		DEDIC	Transfer of management traffic is enabled. The management traffic is transferred in a dedicated timeslot, using a RAD proprietary protocol.
		D-PPP	Transfer of management traffic is enabled. The management traffic is transferred in a dedicated timeslot, using synchronous PPP HDLC encapsulation.
		D-FR	Transfer of management traffic is enabled. The management traffic is transferred in a dedicated timeslot, using frame relay encapsulation (under DLCI 100) in accordance with RFC 1490.
Note: The inband management data rate is as follows: • For the TS0 method, the supported data rates are 4 kbps (use of only one Sa bit), 8 kbps (two Sa bits), 12 kbps (three Sa bits), 16 kbps (four Sa bits), and 20 kbps (all the five Sa bits). • For the DEDIC, D-PPP, and D-FR, the supported data rate is 64 kbps.			
ROUTE_PROT	This field controls the transmission of routing tables, which enable the use of routing for management traffic carried through this port	**NONE**	Routing not supported.
		PROPRIET	Routing of management traffic by means of the RAD proprietary protocol.
		RIP-II	Management traffic is also routed using the RIP2 protocol.

Change the displayed parameters as necessary using the procedure explained above. When done, press **<Enter>** to display the next page.

Third Page of External Port Parameters

If you have selected the static timeslot allocation mode under the **DEF SYS** command, you will see the following typical page, which includes a single parameter:

```
MAX_TS
05
```

The **MAX_TS** parameter is used to select the maximum number of timeslots that may be connected on the selected port, without causing any disruption to the traffic carried by other modules.

Note

If you modify the MAX_TS parameter, the following warning appears: WARNING 118: CHANGE OF USED TS MAY CAUSE DATA ERROR BURST. This means that when you perform the UPD DB command, data error burst is possible.

The allowed range is 1 through 31. If the **FRAME** parameter is **UNFRAMED**, the **MAX_TS** parameter is automatically set to 32, and cannot be changed.

Change the parameter if necessary using the procedure explained above. When done, press **‹Enter›** to display the next page.

Port Timeslot Connection Data Form

You will see the next page of the external port parameters data form. This page is used to select the timeslot mapping mode, and to define the type of timeslots and the mapping parameters in case the sequential mapping mode has been selected.

Note

When using the TRANS (transparent) link mode, you must map all the link timeslots one-to-one to the source port. Therefore, you cannot enable inband management for a port configured for the TRANS link mode.

A typical page is shown below:

```
MAP_MODE    START_TS    NUM_OF_TS    DEST_PORT    TYPE        DEST_START_TS
SEQ         03          14           04:02        DATA        06
```

The parameters included on the third page are explained in *Table 3-3*.

Table 3-3. External Port Timeslot Connection Parameters

Parameter	Function	Values (Default shown in bold)	
MAP_MODE	Selects the timeslot mapping mode for this port. The selection of a timeslot mapping mode is individually made for each port, and does not affect the timeslot mapping mode used on any other port: for example, when the SEQ mode is selected on one port (this mode enables you to route a bundle of timeslots), and that port is routed to a destination port whose mapping mode is USER, the timeslot mapping mode used at the destination port is not changed to SEQ	**SEQ** USER	Sequential mapping. In this mode, the bundle of timeslots defined by the START_TS and NUM_OF_TS parameters is routed to the destination port, and is assigned consecutive timeslots, starting with the timeslot defined by the DEST_START_TS parameter. Timeslots individually mapped by the user.
START_TS	This parameter is applicable only when the SEQ mode is selected. Its function is to indicate the number of the first timeslot in the bundle of timeslots taken from the frames transferred through this port that is to be routed to the destination port	The allowed range of timeslots is 1 through 31 Default: **01**	
NUM_OF_TS	This parameter is applicable only when the SEQ mode is selected. Its function is to indicate the number of the timeslots to be routed between	The allowed range of timeslots is 1 through 31. *Note*: If the value of NUM_OF_TS you have	

Parameter	Function	Values (Default shown in bold)	
	the source and the destination ports. When selecting the number of timeslots, it is necessary to consider the starting timeslot, and the total number of timeslots available on the destination port (e.g., when the destination port is a T1 port, the maximum number of timeslots is 24)	specified exceeds the value of MAX_TS parameter, the following warning appears: ERROR 116: CONFLICT IN NUM OF ALLOCATED TS AND MAX_TS.	
DEST_PORT	This parameter is applicable only when the SEQ mode is selected. Its function is to indicate the destination port	The destination port is entered in the format A:B, where: A is the destination slot number (1 through 15 for the DXC-30, 1 through 5 for the DXC-10A, and 1 through 4 for the DXC-8R). B is the destination port number, 1 to 30.	
Note: *Only E1 and T1 ports can be selected as destinations: if you wish to map timeslots to a D8U, DHS, D8HS or DIM port, then start the mapping from the configuration screens of the DHS, D8HS, DIM or D8U port (for detailed instructions, refer to Chapter 3 of the corresponding Installation and Operation Manual).*			
TYPE	This parameter is used to define the handling of the timeslots transferred to the destination port	**NC**	Timeslot is not connected, and therefore carries the idle code.
		DATA	The timeslots will be handled as data timeslots. This does not preclude the transfer of timeslots carrying voice traffic, provided the equipment connected to the port does not need the conversion services offered by the DXC for voice timeslots.
		MGMT	This timeslot is dedicated to management traffic. The selection is available only for D4E1/D8E1 modules installed in a DXC system with DCL.3 module, when the DEDIC, D-PPP, or D-FR inband management mode is selected, and the timeslot assignment mode is USER.
		VOICE	The data carried in the timeslot is handled as a voice channel. Therefore, when the timeslot is connected to a T1 timeslot, the DXC performs automatically μ-law to A-law conversion.
		VC-MP	Similar to VOICE, except that the A and B signaling bits are not inverted when the timeslot is connected to a T1 link.

Parameter	Function	Values (Default shown in bold)
DEST_START_TS	This parameter is applicable only when the SEQ mode is selected. Its function is to indicate the number of the first timeslot of the destination frame to which the bundle of timeslots being transferred is to be mapped	The allowed range of timeslots is 1 through 24 for routing to a T1 port, or 1 through 31 for routing to an E1 port. When selecting this number, it is necessary to consider the number of mapped timeslots, the mapping method (sequential), and the total number of timeslots available on the destination port (e.g., when the destination port is a T1 port, the maximum number of timeslots is 24 or 25, when the F-bit is also transmitted)

Change the displayed parameters as necessary using the procedure explained above. When done, press **<Enter>**:

- If the **MAP_MODE** is **SEQ**, after pressing **<Enter>** command entry is ended.
- If the **MAP_MODE** is **USER**, after pressing **<Enter>** you will see the first page of the timeslot map.

SEQ Mapping Example

For example, suppose that the DXC system is configured for operation in the bidirectional mode, and the initial timeslot allocation from port 1:1 to port 3:1 is as follows:

- Start timeslot: 1
- Number of timeslots: 20
- Type: data
- Destination timeslot: 1.

In this case, the timeslots 1:1:1 through 1:1:20 would be connected as data timeslots to timeslots 3:1:1 through 3:1:20.

Now suppose that system requirements change, and the following timeslot allocation is made:

- Start timeslot: 1
- Number of timeslots: 10
- Type: NC
- Destination timeslot: 1.

The result will be as follows: timeslots 1:1:1 through 1:1:10 get disconnected from timeslots 3:1:1 through 3:1:10, and timeslots 1:1:11 through 1:1:20 remain connected to timeslots 3:1:11 through 3:1:20. The result can be displayed using the **DSP CON** command.

Port Timeslot Connection Map

The timeslot connection map is used to route individually the timeslots of the selected port, and select the timeslot type.

The timeslot connection map consists of several sections, where each section covers seven timeslots. The first timeslot map section covers the timeslots 1 through 7 (the timeslot number appears in the TS line).

Each section consists of two pages. A typical first page, used to select the destination of each timeslot, is shown below:

```
TS       NO 1       NO 2       NO 3       NO 4       NO 5       NO 6       NO 7
DEST :   03:2:10    03:2:11    04:1:13    07:1:30    12:2:14    07:2:29    07:2:24
```

For each timeslot, you must select the destination. The destination (**DEST**) includes the specification of the destination port, followed by the destination timeslot (the format is A:B:TT, where A and B are the slot and port numbers, and TT is the timeslot number).

Note that you can separately route the F bit, which is indicated as timeslot F on E1 port timeslot maps.

Make sure the destination is not already connected to another port.

- When you route to an E1 port, you can select timeslots in the range of 1 through 31.
- When you route to a T1 port, you can select timeslots in the range of 1 through 24, and F.

After selecting the destinations of the timeslots, press **<Enter>** to display the second page of the first section. The second line is used to select the timeslot type. A typical display is shown below.

```
TS       NO 1       NO 2       NO 3       NO 4       NO 5       NO 6       NO 7
DEST :   01:1:12    03:2:11    04:1:13    07:1:30    12:2:14    07:2:29    07:2:24
TYPE :   MGMT       DATA       DATA       DATA       DATA       DATA       DATA
```

The type is selected as explained in *Table 3-3*. The **MGMT** type means that this timeslot is dedicated to management traffic, and therefore is available only when the **DEDIC**, **D-PPP**, or **D-FR** inband management mode is selected.

Any timeslots that are not used must be selected as **NC** (not connected).

Select the desired connections using the procedure explained above. When done, press **<Enter>** to display the next section, showing timeslots 8 through 14. Repeat the procedure until the last section (ending with timeslot 31) is completed. Press **<Enter>** on the last page to end the command.

Configuration of Internal Port Parameters

- To configure the parameters of the internal management port, type:

```
DEF PORT A:i1<Enter>
```

where **A** is the D4E1/D8E1 slot number (1 through 15 for the DXC-30, 1 through 5 for the DXC-10A, and 1 through 4 for the DXC-8R).

A typical internal port data form is shown below:

```
DEDICATE_TS_AGGR_SPEED
64K
```

The data form is used to select the data rate of the internal management port:

- The internal management port must be connected (in this case, its data rate is 64 kbps) when one of the options which allocate a full timeslot to inband management traffic (**DEDIC**, **D-PPP**, or **D-FR)** is enabled on one of the module ports.
- If inband management is not required, you may select **NC** (not connected).

Displaying D4E1/D8E1-Specific Information

You can display status information on the D4E1/D8E1 module or module port, using the **DSP ST** command. To display the connection table and timeslot utilization for the selected module port, use the **DSP CON** command.

Display of D4E1/D8E1 Module Status

To display information on the software and hardware revisions and check for hardware failures on a selected D4E1/D8E1 module, type:

```
DSP ST A<Enter>
```

where A is the D4E1/D8E1 slot number (1 through 15 for the DXC-30, 1 through 5 for the DXC-10A, and 1 through 4 for the DXC-8R). A typical D4E1/D8E1 status display is shown below:

```
DATABASE:           D8E1
HARDWARE:           D8E1
SOFTWARE REVISION: XX.YY
HARDWARE REVISION: XX.YY
HARDWARE FAILURE:  NO
LINK TYPE:          UNBALANCE
```

Display of D4E1/D8E1 Port Status

To display information on a selected D4E1/D8E1 port, type:

```
DSP ST A:B<Enter>
```

where A is the slot number (1 through 15 for the DXC-30, 1 through 5 for the DXC-10A, and 1 through 4 for the DXC-8R), and B is the module port number, 1 to 8.

A typical display format for a D4E1/D8E1 port is shown below:

```
ALARM             = L.SYNC LOSS          R.SYNC LOSS
                    NO                   NO
LOOPS             = LLB       PLB        LOCAL     REMOTE       MONITOR
                    N/A       N/A        OFF       OFF          OFF
                    TX_PLB    TX_LLB     BERT      TX_INBAND    R_INBAND
                    N/A       N/A        N/A       OFF          OFF
                    TS_REM
                    OFF
OOS CNTR          =
BPV LAST MINUTE   =
BPV WORST MINUTE  =
```

Note

The two lines with BPV counts are displayed only when the port operates with CRC-4 disabled.

The fields included in the D4E1/D8E1 port status information display are explained in *Table 3-4*.

Table 3-4. D4E1/D8E1 Port Status Parameters

Parameter	Function	Values	
ALARM	Indicates the state of the port alarms	L.SYNC LOSS	State of local frame synchronization.
		R.SYNC LOSS	State of remote frame synchronization
LOOPS	Includes subfields that indicate the current state (ON or OFF) of the tests and loopbacks that can be activated for the selected port	The relevant subfields are as follows:	
		PLB	Not applicable to D4E1/D8E1 modules
		LLB	Not applicable to D4E1/D8E1 modules.
		LOCAL	State of user-activated local loopback.
		REMOTE	State of user-activated remote loopback.
		MONITOR	State of monitoring function.
		TX_PLB	Not applicable to D4E1/D8E1 modules.
		TX_LLB	Not applicable to D4E1/D8E1 modules.
		BERT	State of BER test.
		T_INBAND	Transmission of inband loopback activation command to the remote equipment.
		R_INBAND	Reception of inband loopback activation command from the remote equipment.
		TS_REM	Indicates that a loopback is performed on specific timeslots
OOS CNR	Displays the number of local loss of frame alignment events detected since the last time the counters were cleared		
BPV LAST MINUTE	Displays the number of BPV events detected in the last minute		
BPV WORST MINUTE	Displays the number of BPV events detected during the worst minute since the last time the counters were cleared		

Display of D4E1/D8E1 Port Timeslot Map

To display the current connection table and timeslot utilization for the selected D4E1/D8E1 port, type:

```
DSP CON A:B <Enter>
```

You will see the first page of the timeslot map data form. Each data form has several display pages, each presenting data on a group of timeslots. To proceed from page to page, press the **<Enter>** key.

A typical timeslot map is shown below:

```
IO-SLOT - 1  PORT -1 Online DB Time-Slot Cross-Connect Mapping Configuration
PORT TS UTILIZATION PERCENT: 40.000
TS   :  NO  1     NO  2     NO  3     NO  4     NO  5     NO  6     NO  7
TYPE:   DATA  (B) NC        NC        NC        VOICE     NC        NC
DEST:   02:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01
TS   :  NO  8     NO  9     NO 10     NO 11     NO 12     NO 13     NO 14
TYPE:   NC        MGMT      NC        VC-MP     NC        NC        NC
DEST:   01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01
TS   :  NO 15     NO 16     NO 17     NO 18     NO 19     NO 20     NO 21
TYPE:   NC        NC        NC        NC        DATA      NC        NC
DEST:   01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01
TS   :  NO 22     NO 23     NO 24     NO 25     NO 26     NO 27     NO 28
TYPE:   NC        NC        NC        NC        NC        NC        NC
DEST:   01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01  01:01:01
TS   :  NO 29     NO 30     NO 31
TYPE:   NC        NC        NC
DEST:   01:01:01  01:01:01  01:01:01
```

Note *The second line of the data form (PORT TS UTILIZATION PERCENT) appears only if static timeslot allocation mode has been selected.*

Display of Timeslot Utilization

To display the timeslot utilization for all the ports of all the dynamic (Type 2) I/O modules installed in the chassis, type:

```
DSP TS UTILIZATION <Enter>
```

If the static timeslot allocation mode has been selected under DEF SYS, a typical display is shown below.

```
SLOT    PORT     NUM OF CONNECTED TS      MAX TS         UTILIZATION
1       1        2                        5              40.000
1       2        0                        0              0.000
1       3        0                        0              0.000
1       4        0                        0              0.000
```

If the dynamic timeslot allocation mode has been selected, the following error message appears: ERROR 532: ILLEGAL COMMAND FOR TS ALLOCATION MODE.

Display of Timeslot Allocation

To display the number of timeslots free for use, type:

```
DSP TS ALLOC <Enter>
```

DXC displays the timeslot allocation for each port of the first dynamic type module with connected timeslots, followed by the number of free timeslots in the module pool. This number is automatically calculated by the DXC as a sum of free timeslots left beyond MAX TS (between the [MAX TS] and 31), all over the module ports. For those ports where MAX TS was not defined, DXC shows MAX TS as 0 and NUMBER OF FREE TS N/A. If the timeslot allocation mode was defined as dynamic, this screen displays N/A in all the fields. A typical display for the DXC-30 with the DE1B, D8E1, and D4E1 modules installed in the first, second and third slot, respectively, is shown below. The first slot does not appear in the display, since DE1B is not a Type 2 module.

```
DSP TS ALLOCATION:
SLOT:PORT     NUMBER OF FREE TS     MAX TS
2:1           6                     31
2:2           1                     26
2:3           20                    20
2:4           1                     26
2:5           3                     28
2:6           0                     31
2:7           0                     31
2:8           N/A                   0
NUMBER OF FREE TS IN MODULE POOL
19
```

- Press spacebar to see the similar timeslot allocation screen for the next module:

```
DSP TS ALLOCATION:
SLOT/PORT     NUMBER OF FREE TS     MAX TS
3:1           31                    31
3:2           5                     15
3:3           2                     12
3:4           N/A                   0
NUMBER OF FREE TS IN MODULE POOL
4
```

Chapter 4

Troubleshooting and Diagnostics

This chapter explains the module-specific tests and diagnostic functions, and provides information on the alarms generated by the D4E1 and D8E1 modules.

The chapter also includes troubleshooting instructions.

The diagnostic information presented in this chapter supplements the general DXC diagnostics operation instructions contained in the *DXC Installation and Operation Manual*.

4.1 Alarm Messages

Table 4-1 lists the alarm messages generated by the D4E1/D8E1 module, specifies their type (event or state), class (major or minor), and explains their meaning.

Note that each message has an identification code (listed in parentheses). The table lists the alarm messages in ascending order of their codes.

Note

A state alarm is an alarm that is in the ON state while a certain condition is present, and automatically changes to OFF when the condition is no longer present. This type of alarm cannot be cleared (removed from the alarm buffer) while it is in the ON state.

An event alarm is an alarm that records the occurrence of an event. This type of alarm can be cleared at any time.

Table 4-1. D4E1/D8E1 Alarm Messages

Alarm	Alarm Syntax	Meaning	Type	Class
09	HARDWARE FAILURE: IO-A	A hardware fault has been detected in the D4E1/D8E1 module installed in the specified slot	State	Major
10	MODULE WAS REMOVED: IO-A	The D4E1/D8E1 module installed in the specified slot has been removed	Event	Minor
16	PROGRAMMED/ INSTALLED MODULE MISMATCH	The modules that have been read from the DXC do not match the modules programmed in the database	State	Major
29	SIGNAL LOSS: IO-A:B	Loss of input signal on specified E1 port	State	Major

Alarm	Alarm Syntax	Meaning	Type	Class
30	EXCESSIVE BPV: IO-A:B	The rate of bipolar violation errors on specified E1 port is too high	State	Major
31	AIS OCCURRED: IO-A:B	AIS is being detected on specified E1 port	State	Major
33	AIS SYNC LOSS: IO-A:B	AIS and loss of frame alignment on specified E1 port	State	Major
35	LOCAL SYNC LOSS: IO-A:B	Local loss of frame alignment on specified E1 port	State	Major
36	LOCAL MF ALARM: IO-A:B	Local loss of multiframe alignment on E1 port	State	Major
37	REMOTE MF ALARM: IO-A:B	The remote unit connected to the other end of the link connected to the specified E1 port reports loss of multiframe alignment	State	Major
39	REMOTE SYNC LOSS: IO-A:B	The remote unit connected to the other end of the link connected to the specified E1 port reports loss of frame alignment	State	Major
40	FRAME SLIP: IO-A:B	A frame slip occurred on the specified E1 port	Event	Major
41	BPV ERROR: IO-A:B	A bipolar violation error has been detected on the specified E1 port	Event	Minor
42	EXCESSIVE ERR RATIO: IO-A:B	Excessive bit error rate (higher than 10^{-3}) on the specified E1 port	State	Major
43	CRC-4 ERROR: IO-A:B	Bit errors have been detected by CRC-4 checking on the specified E1 port	Event	Minor
46	MANAGEMENT PORT IS LOOPED, IO-A:B	A loopback has been activated on the management port	State	Major
47	MANAGEMENT PORT IS DOWN, IO-A:B	DXC cannot communicate with the network management station through the specified E1 port because of a failure or wrong setup	State	Major
54	LOOP INBAND ON, IO-A:B	The inband code-activated loopback has been activated	State	Minor
55	CRC MULTIFRAME ALIGNMENT LOSS, IO-A:B	Loss of CRC-4 multiframe alignment on the specified E1 port	State	Major

4.2 Diagnostics

Test and Loopback Functions

This section describes the tests and loopbacks supported on the external D4E1/D8E1 ports.

The D4E1/D8E1 module supports three types of user-controlled loopbacks, which can be independently activated for each port:

- Local loopback
- Remote loopback
- Inband code-activated loopback (on all timeslots, or on specific timeslots)
- Remote timeslot loopback
- BER testing.In addition, each D4E1/D8E1 module port can perform a bit rate test (BER) on the link connected to that port.

The loopback signal paths illustrated below include the DCL module, which is actually involved only when routing individual timeslots from other ports to the D4E1 or D8E1 ports (see *Port Routing Mode* in *Chapter 1*).

Local Loopback

The local loopback, activated by the command **`LP L A:B`**, is used to test the path of the signals intended for transmission through a selected D4E1/D8E1 port: this path starts with the other DXC port(s) and continues up to the D4E1/D8E1 module circuits associated with the selected port (including the port interface and the operation of the routing circuits that handle the port signals within the D4E1/D8E1 module).

As a result, this loopback also checks the operation of the local DXC, and the connections to the equipment that provides the signal (or the individual timeslots, as applicable) reaching the tested port through the DCL module.

Figure 4-1 shows the signal paths of a typical local loopback (activated on external port 1).

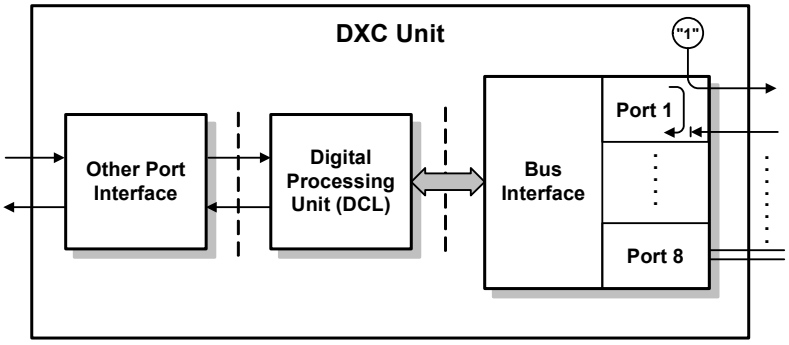

Figure 4-1. Typical Local Loopback Signal Path

When the local loopback is activated on a selected port, the port interface returns the port transmit signal to the input of the receive path, within the LIU (see *Functional Block Diagram* in *Chapter 1*. The test signal is provided by the equipment whose data stream (or timeslots) are routed by the DCL module to that port: this equipment must receive its own transmission.

While the local loopback is activated, the local D4E1/D8E1 port sends an unframed "all-ones" signal to the link.

Remote Loopback

The remote loopback, activated by the command **`LP R A:B`**, is used to test the interface circuits of a given D4E1/D8E1 port. This test also checks the transmission plant connecting the remote equipment to the corresponding port interface of the D4E1/D8E1 module.

Figure 4-2 shows the signal paths of a typical remote loopback (activated on external port 1).

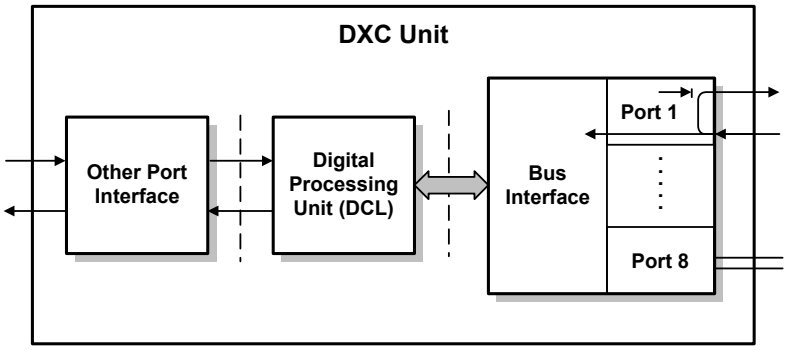

Figure 4-2. Typical Remote Loopback Signal Paths

The remote loopback is performed by connecting the port receive signal, after regeneration, to the port transmit path, within the LIU. The test signal is provided by the user equipment connected to the remote end of the link, which must receive its own transmission.

Inband Code-Activated Loopback

The inband code-activated loopback, activated by the command **`LP INBAND A:B`**, is performed by transmitting, within all the active timeslots, the loopback activation sequence specified in ANSI T1.403.

The activation sequence is generated by the test sequence generator of the port, and is inserted in the required timeslots of the E1 data stream sent by the D4E1/D8E1 port. When remote equipment which supports the inband code-activated loopback receives the loopback activation sequence, it connects a loopback at the output of its framer, as shown in *Figure 4-3.* This loopback affects only the timeslots defined by the user by means of the DEF BERT command.

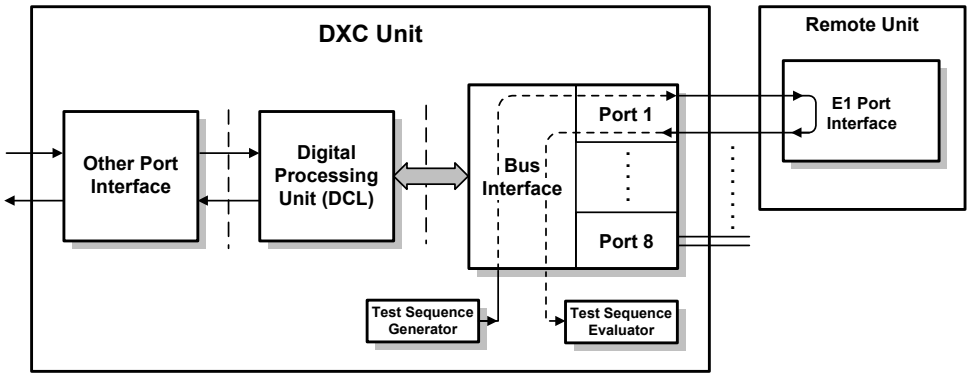

Figure 4-3. Typical Inband Code-Activated Loopback Signal Paths

After the remote equipment connects the loopback, the test sequence evaluator of the D4E1/D8E1 port starts detecting its own activation sequence, and the transmission of the loopback activation sequence stops. The loopback activation process typically requires two to four seconds. The loopback is deactivated by transmitting the inband loopback deactivation sequence.

Remote Timeslot Loopback

The remote timeslot loopback is activated by means of the command **`LOOP TS REM`**. This loopback is similar to the remote loopback described above, except that it is activated only on the timeslots defined by the user by means of the DEF BERT command.

The signal received by a module port is regenerated and processed by the E1 framer. The loopback is performed at the output of the framer, by connecting the specified timeslots back to the input of transmit path of the same port. The resulting signal is returned toward the remote equipment, as shown in *Figure 4-4*.

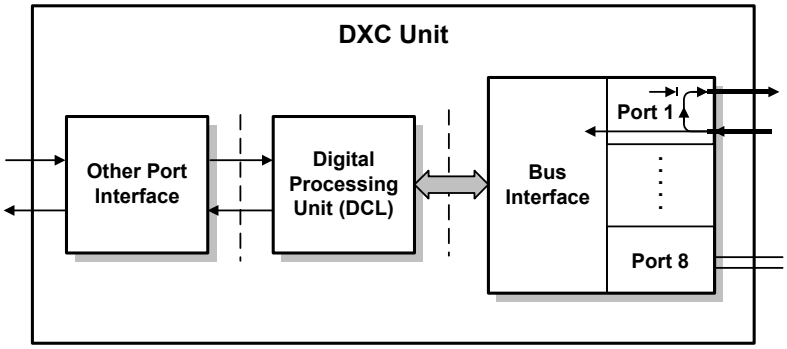

Figure 4-4. Remote Timeslot Loopback

BER Testing

The BER test, activated by the command **`LP BERT A:B`**, is used to evaluate data transmission through selected timeslots of the link connected to a selected port of the D4E1/D8E1 module without using external test equipment.

The BER test setup is shown in.

- Data transmission is checked by applying a test sequence generated by an internal test sequence generator towards the remote equipment. The test sequence, and the timeslots in which the sequence is transmitted, are defined by means of the DEF BERT command.
- The transmitted data is returned by means of a loop, somewhere along the data path, to the test sequence evaluator. The evaluator compares the received data, bit by bit, to the original data and detects any difference (bit error). The output of the evaluator is sampled during module polling, to check whether errors were detected in the interval between consecutive pollings.

The test results are displayed on a supervision terminal as a number in the range of 0 (no errors detected during the current measurement interval) through 63535.

The number of errors is accumulated from the activation of the BER test. During the BER test, the tested port is disconnected from the DCL module.

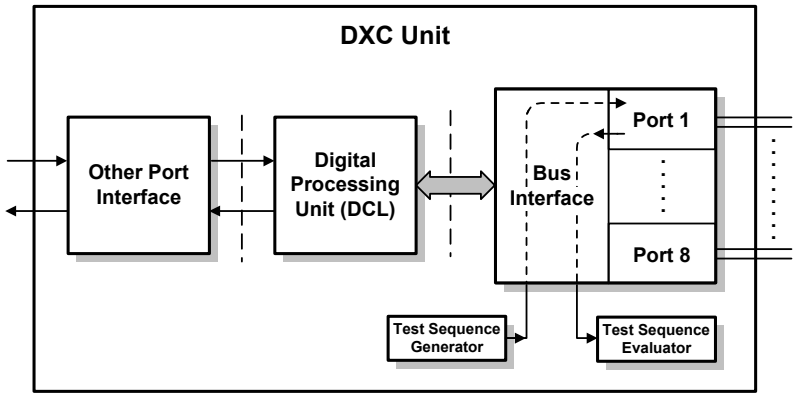

Figure 4-5. BER Testing

To display the test results, perform the **`DSP BERT`** command (see *DXC Installation and Operation Manual* for additional details).

4.3 Recommended Test Sequence

The loops available on the D4E1/D8E1 module provide a rapid and efficient way to identify the general location of a fault at one of the following locations:

- At one of the D4E1/D8E1 modules connected in a link.
- In the external user's equipment.
- In the connections of the user's equipment to the D4E1/D8E1 ports.

If a complaint is received regarding the transmission of data through one of the D4E1/D8E1 ports, perform the following procedure until the problem is located. After each step, continue to the next step only if the specified test is successfully completed.

Troubleshooting New Connections

If the problem is detected when a connection between two new users is activated for the first time, before starting the general troubleshooting procedure described below, perform the following checks:

- Thoroughly check the timeslot allocation.
- Check the configuration of the DXC and of the other equipment units that provide the new connection.
- Check the configuration of the user's equipment.

If these checks do not correct the problem, perform the general troubleshooting procedure.

General Troubleshooting Procedure

Perform the following procedure until the problem is located. After each step, continue to the next step only if the specified test is successfully completed.

- Request the local user to perform a local loopback on the user's equipment.
  - If the user's equipment does not receive its own signal while the loopback is connected, the problem is in the equipment. Use the corresponding equipment manual to locate the problem.
  - Check the connections to the user's equipment, and the user's equipment itself. After correcting the equipment connection problem, continue troubleshooting as explained below.
- Activate the local loopback on the suspected E1 port:
  - In case the user's equipment does not receive its own signal when the loopback is connected, the problem is in the local unit.
  - In case the signal is received when the local loopback is activated, activate the remote E1 loopback.
  - In case the remote user equipment does not receive its own signal, the problem is either related to the timeslot allocation, or is an equipment problem caused by the remote unit.

4.4 Frequently Asked Questions

Question: Is it necessary to configure the TS0 inband management parameters for the two D8E1/D4E1 ports of a redundant pair?

Answer: No.
For TS0 management configuration for redundant D8E1 ports, the configuration for inband management is necessary only in the first one of them. For example, for redundant ports 4:3 and 4:4, the management parameters must be configured only on port 4:3.

Question: What is the procedure for configuring a unidirectional (broadcast) application for dynamic modules D8T1, D4T1, D8E1 and D4E1?

Answer: The procedure for configuring a unidirectional (broadcast) application for these dynamic modules should be according the following example:

Broadcaster port 1:1 must transfer five time slots to 1:2 and 1:3

1. DEF SYS --> Matrix_Mode = Bidirectional
2. DEF PORT 1:1 --> five time slots mapped to port 1:2
3. UPD DB
4. DEF SYS --> Matrix_Mode = Unidirectional
5. DEF PORT 1:3 --> five time slots mapped to port 1:1

Note that ports 1:1 and 1:2 will have a bi-directional connection. Port 1:3 will have a unidirectional connection to 1:1.

When the broadcaster node comes from a dynamic module, it should be configured as bi-directional with one of the targets.

4.5 Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide. This information can be found at www.rad.com (offices – About RAD › Worldwide Offices; distributors – Where to Buy › End Users).

Appendix A

Pinouts

The following sections describe the two adapter cables, and the functions of the 44-pin connector pins for each interface type.

A.1 CBL-G703-8/RJ45 Cable

The CBL-G703-8/RJ45 is a 2-meter long cable for use with the balanced E1 and T1 interfaces. This is the only cable suitable for use with D4E1, D8E1 modules.

Figure A-1 shows the cable construction. *Table A-1* presents the cable wiring and identifies the interface connector pin assignment.

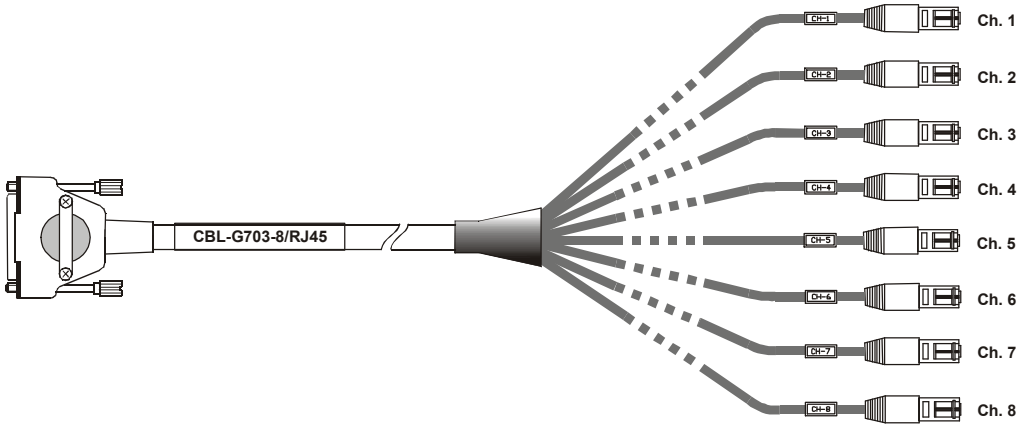

Figure A-1. CBL-G703-8/RJ45 Cable

Table A-1. CBL-G703-8/RJ45 Cable Wiring

Channel	RJ-45 Connector	44-Pin Connector		RJ-45 Connector Pins	Channel	RJ-45 Connector	44-Pin Connector		RJ-45 Connector Pins
		Pin	Function				Pin	Function	
1	CH-1	31	RX Ring	1	5	CH-5	37	RX Ring	1
		17	RX Tip	2			23	RX Tip	2
		16	TX Ring	4			22	TX Ring	4
		1	TX Tip	5			7	TX Tip	5
2	CH-2	33	RX Ring	1	6	CH-6	38	RX Ring	1
		32	RX Tip	2			39	RX Tip	2
		2	TX Ring	4			8	TX Ring	4
		3	TX Tip	5			9	TX Tip	5
3	CH-3	34	RX Ring	1	7	CH-7	40	RX Ring	1
		20	RX Tip	2			26	RX Tip	2
		19	TX Ring	4			25	TX Ring	4
		4	TX Tip	5			10	TX Tip	5
4	CH-4	35	RX Ring	1	8	CH-8	41	RX Ring	1
		36	RX Tip	2			42	RX Tip	2
		5	TX Ring	4			11	TX Ring	4
		6	TX Tip	5			12	TX Tip	5

A.2 CBL-G703-8/COAX Cable

The CBL-G703-8/COAX is a 2-meter long cable for use with the unbalanced E1 interfaces. *Figure A-2* shows the cable construction.

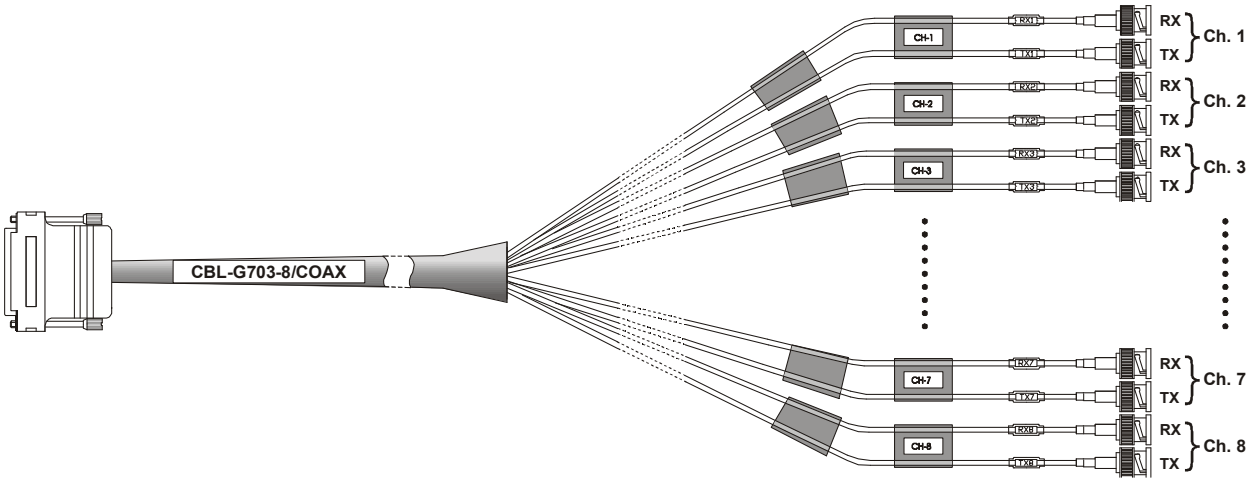

Figure A-2. CBL-G703-8/COAX Cable

Table A-2 presents the cable wiring and identifies the interface connector pin assignment. As listed in the table, in this cable pin 15 (cable type sensing) is wired to pin 30 (frame ground): this enables the D4E1, D8E1 module to differentiate between the connection of this cable and the connection of the CBL-G703-8/RJ45 cable.

Table A-2. CBL-G703-8/COAX Cable Wiring

Channel	Function	44-Pin Connector		BNC Contact
		Pin	Function	
1	RX	31	Ring	Shield
		29	Frame Ground	
		17	Tip	Center
	TX	1	Tip	Center
		16	Ring	Shield
		14	Frame Ground	
2	RX	33	Ring	Shield
		44	Frame Ground	
		32	Tip	Center
	TX	3	Tip	Center
		2	Ring	Shield
		29	Frame Ground	
3	RX	34	Ring	Shield
		29	Frame Ground	
		20	Tip	Center
	TX	4	Tip	Center
		19	Ring	Shield
		14	Frame Ground	
4	RX	35	Ring	Shield
		44	Frame Ground	
		36	Tip	Center
	TX	6	Tip	Center
		5	Ring	Shield
		29	Frame Ground	
5	RX	37	Ring	Shield
		29	Frame Ground	
		23	Tip	Center
	TX	7	Tip	Center
		22	Ring	Shield
		14	Frame Ground	
6	RX	38	Ring	Shield
		44	Frame Ground	
		39	Tip	Center
	TX	9	Tip	Center
		8	Ring	Shield
		14	Frame Ground	
7	RX	40	Ring	Shield
		29	Frame Ground	
		26	Tip	Center
	TX	10	Tip	Center
		25	Ring	Shield
		14	Frame Ground	
8	RX	41	Ring	Shield
		44	Frame Ground	
		42	Tip	Center
	TX	12	Tip	Center
		11	Ring	Shield
		14	Frame Ground	
Cable Type Sensing		15	Sense Input	–
Signal Ground		30	Ground	–
Frame Ground		44	Cable Shield	–

RAD data communications
The Access Company

24 Raoul Wallenberg Street, Tel Aviv 69719, Israel
Tel: +972-3-6458181, Fax +972-3-6483331, +972-3-6498250
E-mail: erika_y@rad.com, Web site: http://www.rad.com

Customer Response Form

RAD Data Communications would like your help in improving its product documentation. Please complete and return this form by mail or by fax or send us an e-mail with your comments.

Thank you for your assistance!

Manual Name: D4E1, D8E1 version 10.1

Publication Number: 772-236-11/08

Please grade the manual according to the following factors:

	Excellent	*Good*	*Fair*	*Poor*	*Very Poor*
Installation instructions	❒	❒	❒	❒	❒
Operating instructions	❒	❒	❒	❒	❒
Manual organization	❒	❒	❒	❒	❒
Illustrations	❒	❒	❒	❒	❒
The manual as a whole	❒	❒	❒	❒	❒

What did you like about the manual?

_____

_____

_____

_____

Error Report

Type of error(s) or problem(s):

- ❒ Incompatibility with product
- ❒ Difficulty in understanding text
- ❒ Regulatory information (Safety, Compliance, Warnings, etc.)
- ❒ Difficulty in finding needed information
- ❒ Missing information
- ❒ Illogical flow of information
- ❒ Style (spelling, grammar, references, etc.)
- ❒ Appearance
- ❒ Other _____

Please list the exact page numbers with the error(s), detail the errors you found (information missing, unclear or inadequately explained, etc.) and attach the page to your fax, if necessary.

_____

_____

_____

_____

Please add any comments or suggestions you may have.

_____

_____

_____

You are:

- ❒ Distributor
- ❒ End user
- ❒ VAR
- ❒ Other

Who is your distributor? _____

Your name and company: _____

Job title: _____

Address: _____

Direct telephone number and extension: _____

Fax number: _____

E-mail: _____

Publication No. 772-236-11/08

International Headquarters

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

North America Headquarters

900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@radusa.com

www.rad.com

RAD
data communications
The Access Company